

## What is Claimed:

1                   1.     A method for treating a metal surface to minimize rust  
2     formation, said method comprising the steps of:

3                   contacting the metal surface with a cleaning solution to form a  
4     cleaned metal surface;

5                   rinsing said cleaned metal surface with water to form a rinsed  
6     metal surface; and

7                   contacting said rinsed metal surface with a pretreating solution  
8     comprising a blend of water, an organo-functional silane, and a borate ester  
9     to form a pretreated metal surface;

10                  drying said pretreated metal surface to form a dried metal  
11     surface; and

12                  applying a decorative coating to said dried metal surface.

1                   2.     The method in accordance with claim 1, wherein:

2                   said organo-functional silane is selected from the group  
3     consisting of an aminopropyltriethoxy silane, a vinyl triethoxy silane, and a  
4     Bis (gamma trimethoxysilylpropyl) amine and mixtures thereof; and

5                   said borate ester is selected from the group consisting of  
6     monoethanolamine borate and monoisopropanolamine borate and mixtures  
7     thereof.

1                   3.     The method in accordance with claim 2, wherein:

2                   said organo-functional silane is an aminopropyltriethoxy silane;  
3     and

4                   said borate ester is monoethanolamine borate.

1                   4.     The method in accordance with claim 1, wherein said  
2     organo-functional silane and said borate ester are added in an amount to

3 achieve a coating weight of about 1.2 to about 6.5 mg per square foot on said  
4 dried metal surface.

1 5. The method in accordance with claim 1, wherein said  
2 organo-functional silane and said borate ester are added in an amount to  
3 achieve a total weight percent of about 1.0% to about 4.0%.

1 6. The method in accordance with claim 5, wherein said  
2 organo-functional silane and said borate ester are added in an amount to  
3 achieve a total weight percent of about 1.5% to about 3.0%.

1 7. The method in accordance with claim 1, wherein said  
2 cleaning solution comprises water and an alkaline-based cleaner.

1 8. The method in accordance with claim 7, wherein said  
2 alkaline-based cleaner comprises potassium hydroxide.

1 9. The method in accordance with claim 1, wherein the step  
2 of applying the decorative finish to said dried metal surface is done after  
3 waiting at least 8 days.

1 10. The method in accordance with claim 1, wherein the step  
2 of applying the decorative finish to said dried metal surface is done after  
3 waiting at least 12 days.

1 11. The method in accordance with claim 1, wherein said  
2 decorative finish comprises paint.

1 12. The method in accordance with claim 1, wherein the  
2 metal surface comprises steel.

1           13. The method in accordance with claim 1, wherein the  
2 rinsing step is carried out, in sequence, in a first stage using water at an  
3 elevated temperature and a second stage using water at room temperature.

1           14. The method in accordance with claim 13, wherein the  
2 elevated temperature of water at said first stage is between about 100°F and  
3 140°F and the room temperature of water at said second stage is between  
4 about 65°F and 75°F.

1           15. In a method for pretreating a metal surface in which a  
2 cleaned metal surface is pretreated then dried in preparation for application  
3 of a decorative coating to the dried metal surface, the improvement  
4 comprising pretreating said cleaned metal surface by contacting said cleaned  
5 metal surface with a pretreating solution comprising a blend of water, an  
6 organo-functional silane, and a borate ester.

1           16. The method in accordance with claim 15 further  
2 comprising rinsing the cleaned metal surface with water after the cleaning  
3 step.

1           17. A composition for use in the treatment of a metal surface  
2 comprising a blend of water, an organo-functional silane, and a borate ester.

1           18. The composition in accordance with claim 17, wherein:

2           said organo-functional silane is selected from the group  
3 consisting of an aminopropyltriethoxy silane, a vinyl triethoxy silane, and a  
4 Bis (gamma trimethoxysilylpropyl) amine and mixtures thereof; and

5           said borate ester is selected from the group consisting of  
6   monoethanolamine borate and monoisopropanolamine borate and mixtures  
7   thereof.

1           19.   The composition in accordance with claim 18, wherein:  
2           said organo-functional silane is an aminopropyltriethoxy silane;  
3   and  
4           said borate ester is monoethanolamine borate.

1           20.   The composition in accordance with claim 17, wherein  
2   said organo-functional silane and said borate ester are added in an amount to  
3   achieve a total weight percent of about 1.0% to about 4.0%.

1           21.   The method in accordance with claim 20, wherein said  
2   organo-functional silane and said borate ester are added in an amount to  
3   achieve a total weight percent of about 1.5% to about 3.0%.

1           22.   A composition for use in the treatment of a metal surface  
2   consisting of a blend of water, an organo-functional silane, and a borate  
3   ester.

1           23.   A method for treating a metal surface to minimize rust  
2   formation, said method comprising the steps of:

3           contacting the metal surface with a combined  
4   cleaning/phosphatizing bath to form a pretreated metal surface;

5           rinsing said pretreated metal surface with water to form a  
6   rinsed metal surface;

7 sealing said rinsed metal surface by contacting said rinsed metal  
8 surface with a sealing solution comprising a blend of water, an organo-  
9 functional silane, and a borate ester to form a sealed metal surface;

10 drying said sealed metal surface to form a dried metal surface;

11 and

12 applying a decorative coating to said dried metal surface.

1 24. The method in accordance with claim 23, wherein said  
2 combined cleaning/phosphatizing bath comprises a cleaning agent, an iron  
3 phosphate pretreating composition, and water.

1 25. A method for treating a metal surface to minimize rust  
2 formation, said method comprising the steps of:

3 contacting the metal surface with a cleaning solution to form a  
4 cleaned metal surface;

5 rinsing said cleaned metal surface with water to form a rinsed  
6 metal surface;

7 contacting said rinsed metal surface with a pretreating solution;

8 rinsing said pretreated metal surface with water to form a  
9 rinsed metal surface;

10 sealing said rinsed metal surface by contacting said rinsed metal  
11 surface with a sealing solution comprising a blend of water, an organo-  
12 functional silane, and a borate ester to form a sealed metal surface

13 drying said sealed metal surface to form a dried metal surface;

14 and

15 applying a decorative coating to said dried metal surface.

1 26. The method in accordance with claim 25, wherein said  
2 pretreating solution comprises an iron phosphate pretreating composition and  
3 water.

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